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ENRICO BARONE'S "MINISTRY OF PRODUCTION": CONTENT AND CONTEXT

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Abstract

Enrico Barone's famous article on economic planning, "Il Ministro della Produzione nello Stato Collettivista" ("The Ministry of Production in the Collectivist State"), which showed the theoretical possibility of an economically efficient collectivist planned economy, was published in *Giornale degli Economisti* in 1908. Barone's article has been widely cited, particularly in the comparative economic systems literature, but it has not been very widely read or analyzed in recent years, and there is not much literature that places Barone's "Ministry" model in the context of his other works or in its historical, social, or ideological context. The aims of this paper are: a) to analyze Barone's model in depth and to clarify a text which is often obscure; b) to interpret the most problematic passages using Barone's other writings, and the later literature on the subject; and c) to examine the apparent contradiction between Barone's hostility to socialism and his attempt to formulate the pure theory of the collectivist economy.

Keywords: history of economics, socialist calculation, collectivism, marginalism, Italian economic thought

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INTRODUCTION

Enrico Barone's famous article on economic planning, "Il Ministro della Produzione nello Stato Collettivista" ("The Ministry of Production in the Collectivist State"), which showed the theoretical possibility of an economically efficient collectivist planned economy, was published in *Giornale degli Economisti* in 1908 (Barone 1908b). Barone's article has been widely cited, particularly in the comparative economic systems literature, but it has not been very widely read or analyzed in recent years, following the collapse of the centrally directed economies of the former USSR and Eastern Europe, the emergence of a market economy in China, and the shrinking of the socialist sectors of mixed Western European economies. With the exception of Peter Dooley's excellent short summary (Dooley 1998), Barone's "Ministry" model has received scant treatment in the economic literature, and there is not much literature that places Barone's "Ministry" model in the context of his other works or in its historical, social, or ideological context.

The aims of this paper are: a) to analyze Barone's model in depth and to clarify a text which is often obscure; b) to interpret the most problematic passages using Barone's other writings, and the later literature on the subject; and c) to examine the apparent contradiction between Barone's hostility to socialism and his attempt to formulate the pure theory of the collectivist economy[1]. This paper is also an opportunity to make the literature on Barone written in Italian known to a wider audience[2].

Part I of our paper examines the context in which Barone constructed his model. Part II examines the substance of Barone's "Ministry" model. Part III deals with the impact of Barone's "Ministry" model first on the Italian literature, and then on the later development of

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[1] For example Schumpeter ([1954] 1976, p. 986) writes that Barone, together with von Wieser and Pareto, was "completely out of sympathy with socialism".

[2] All translations of quotations are our own, if not already available in English.

socialist economics. In the concluding section all of our considerations and interpretations about Barone's motivations are summarized.

I. BARONE'S "MINISTRY" IN CONTEXT[3]

The debate on planning

Barone's "Ministry" was an intervention in the debate on Marxism and planning. It takes up the question of price determination in a collectivist economy that had been raised by Léon Walras. There are also several previous Italian interventions in this literature[4], among which Pareto's is prominent. When Barone wrote his "Ministry", Pareto had already suggested examining scientifically the outcomes of the collective property of the means of production[5]. Pareto had already spoken of the possibility of carrying out a "scientific" comparison of different economic systems. In his *Manual of Political Economy* Pareto concluded that: "pure economics does not give us a truly decisive criterion for choosing an organization of society based on private property and a socialist organization" (Pareto [1906] 1971, p. 269)[6]. Barone's intervention builds upon a question that had already been raised[7].

Military career and political involvement

Barone had a military career before he became an academic economist. He was educated in military academies, and was a career soldier and teacher of the military arts and military history. His military

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[3] This section is based on Barone's biography by Gentilucci (2006) and on the extensive and illuminating analyses of Michelini (2001, 2005 and 2007). However, the responsibility for its contents remains entirely that of the authors.
[4] Michelini (2001, p. CVII), concentrating on the Italian Marginalists, recalls Pareto (1897-98 and 1906), Pantaleoni (1898 and 1904) and Montemartini (1902).
[5] For an analysis of Paretian thinking on the possibility of realizing the "maximum collective welfare" in a socialist economy and on the comparison of its costs with those of a free market economy see Mornati (2001).
[6] Michelini (2005, pp. 747-751 and pp. 756-758) reconstructs critically Pareto's position on the impossibility of innovation in a socialist state.
[7] Before the "Ministry" in 1908, Barone himself had already written against Marxism (Barone 1898).

origins are significant because they may have predisposed him to favor some type of centralized economic control and planning, since centralized allocation of resources through a military chain of command has some similarities with a centrally planned economy[8].

In one of his military writings (Barone 1898), concerning phenomena linked to war, Barone stated that although individuals are rational, the collectivity is moved by irrational feelings and instincts due to the power of suggestion the crowd transmits. Given these characteristics, Barone thought that society taken as a whole is not capable of rationally pursuing its own economic welfare; it must therefore place itself in the hands of a rational head of state[9]. Apart from "irrational" collective psychology, the disconnect between rational individual preferences and a social welfare function is the central issue in the analysis of social welfare by Bergson, Scitovsky and others, as well as Arrow's famous impossibility theorem (Arrow 1951). The need for a rational head of state to define social welfare is close to Arrow's argument that one the ways that a social welfare function can be defined is by "imposition" of the preferences of an authority on society.

Going back to Barone, we wish to emphasize the fact that between Barone's "Ministry" and his previous military text there is continuity in the idea, present in both, of an enlightened and rational leader working efficiently[10].

Another important feature to remember when contextualizing the "Ministry" is that Barone was very involved in politics and the application of economic analysis to real-world policy issues. He was active politically,

[8] There is a substantial body of literature on the war economy, some of which was written prior to and during World War I, which analyzes the allocation of resources by a centralized military authority which bears some resemblance to Barone's "Ministry". However, there is no mention or citation of Barone in any of this work.

[9] We follow the interpretation of Gentilucci (2006, p. 19) here.

[10] This continuity is pointed out by Gentilucci (2006, pp. 203-210).

but never succeeded in his attempts to become a member of Parliament[11].

Barone thought that the government is a class apparatus, and always represents specific interests[12]. For this reason he supported the industrial bourgeoisie and its hegemony within the state (Michelini 2005, p. 772-773), in other words for him the bourgeoisie should remain the ruling class[13]. Barone was anti-democratic and opposed the universal franchise and the participation of the masses in running the country. He thought that mass democracy would lead to socialism, which he thought would inevitably destroy wealth and lower social welfare.

For Barone the extent of state intervention in the economy cannot be decided upon *a priori* because for him there is no rule valid at all times, for every place and all services[14]. He argued that if you could rely on a state (*i.e.* a bureaucracy) being intelligent, diligent, working hard for the public good, and honest, many individualists would become converted to statism (Barone [1911-12] 1937, p. 95).

Barone was a nationalist from the start, especially after 1909 when he founded "La Preparazione", a journal dedicated to military-political issues that aimed to prepare the country for military expansion. For Barone, nationalism was needed to enable Italy to pass from being an agrarian country to an industrial one. For this reason he exalted war and was against pacifism. He was in favour of Italy's entry into the First World War (Michelini 2005, p. 769). In 1911 he returned briefly to a

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[11] In the elections of 1904 and in those of 1915 (Gentilucci 2006, pp.35-38).

[12] This Machiavellian conception of the government, consisting of subjects who pursue their own interests, is shared by the entire group of Italian Marginalists, such as Pareto, De Viti de Marco, and Pantaleoni.

[13] We are referring here to the concept of ruling class originally introduced by the *élite* theorist Gaetano Mosca (1896), of whom Barone was a follower (Gentilucci 2002, p. 50, *fn* 2).

[14] For Barone: "the limit of the functions that one must and can assign to the state is a question of opportunity … It is not a question that can be solved with *a priori* criteria" (Barone [1914-15] 2002, p. 141).

subject linked to planning[15] in which he examined the effects of prices that were not "economic" but "political" – *i.e.* fixed by the government with a redistributive purpose and, in Barone's words, "with hatred for the superior classes" (Barone 1911 [1936], p. 305). He reached the conclusion that a system of this kind would destroy itself[16].

After World War I Barone was still a militant nationalist, strongly critical of democracy and anti-socialist. His essay *La Rivoluzione Francese (The French Revolution)* dates from this period. In this essay, which compares forms of government, Barone reiterated the idea that that "there are examples – and modern Germany is one – in which a greater breadth of functions of the state may turn out to be advantageous. However – he adds – background conditions and political arrangements are required that democratic states in general do not possess" (Barone [1914-15] 2002, p. 141)[17]. On popular democracy as a form of government his judgment is drastic: "the irruption of broad majorities into the sharing of power has the result … of a trend towards statocracy. But it is actually harmful to the maximum collective utility" (Barone [1914-15] 2002, p. 140).

Barone was in favor of Mussolini's rise and the economic policy of his first government[18]. In his 1923 article "Italia e Stati Uniti" he expressed the hope that Mussolini would succeed in strengthening the Italian economy by fostering nationalist feeling, and that he would be able to give support to the bourgeoisie to obtain "the lowest cost of production" (Barone 1923, p. 139). In this article he also reiterated his belief in *élite* theory, according to which in the government of the nation

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[15] "Nota matematica allo studio di M. Pantaleoni 'Considerazioni sulle proprietà di un sistema di prezzi politici'" ("A Mathematical Note on the Study of M. Pantaleoni, 'Considerations on the Properties of a System of Political Prices'"). See Pantaleoni (1911) and Barone (1911).

[16] An analysis of the "political prices" in Pantaleoni can be found (in Italian) in Bellanca and Giocoli (1998, pp. 180-194).

[17] Barone is referring to the autocratic Germany of Bismark, which had successfully introduced a top-down management of the economy.

[18] Mussolini's first government (1922-1924) was a coalition of liberals, Catholics and members of the Fascist Party.

a turnover of its best subjects was always needed, to quickly replace "degenerate" elements. This idea makes it clear that he was against dictatorship[19]. Barone died in 1924, a year before the establishment of Mussolini's Fascist dictatorship in 1925.

The economist

Barone wrote his first six economic theory articles in 1894 and 1895[20], while serving in the army. His review article on Irving Fisher's *Mathematical Investigations in the Theory of Value and Prices* (Barone 1894b), one of the earliest mathematical economics texts, was important in the dissemination of Fisher's early work in Italy (Pavanelli 2006, p. 270)[21].

Barone left the army to teach economics at the University of Rome in 1906. "The Ministry of Production" and the first volume of the textbook *Principi di Economia Politica* (*Principles of Political Economy*) both date from 1908[22]. This text went through a large number of new editions and reprintings[23]. On comparing the first volume of the *Principi* with those published later, we can see what Barone modified on the basis of the development of his thinking on the subject of the "Ministry". This comparison indicates that the 1908 volume of the *Principi* was written before the "Ministry"[24], and above all allows us to bring into focus three

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[19] We follow the interpretation of Gentilucci (2006, pp. 69-70) here.

[20] These are Barone (1894a, 1894b, 1894c, 1894d, 1895a) all published in the *Giornale degli Economisti,* and Barone (1895b).

[21] "When he discovered that Fisher was in Florence, Barone seized the opportunity to discuss the work with him … Barone, a military officer at the time, arrived early in the morning, bearing his own copy of Fisher's text for review. During their conversation, he enthusiastically praised the text, announcing that he had read 'every word' of it, and declaring that it would guarantee its author a place among the ranks of the greatest theoretical economists" (Pavanelli 2006, p. 270).

[22] The second volume of his *Principi* appeared the following year.

[23] After the first edition in two volumes (1908 and 1909), followed those in one volume of 1912, 1913, 1915, 1919 and 1920. There were then the posthumous editions of 1925 and 1929. Finally, there is the edition of 1936 which puts together other later didactic writings highlighting all the additions to the first edition (Barone 1936). On Barone's thought in the various editions of the *Principi* see Michelini (2007).

[24] There are in particular passages where in the first edition Barone postpones the demonstration of some propositions to a later treatment, within a study of socialist systems; in the later editions these passages are substituted by demonstrations in which a reference appears to the Ministry of

objectives of Barone — *i.e.* to demonstrate the theoretical possibility of the collectivist régime; the reappearance in a régime of this kind of the same categories as the market economy; and the impossibility of economically efficient collectivism in practice. We shall be coming back to these subjects later.

The most innovative feature of Barone's "Ministry" article lies in its method (Gentilucci 2006, p. 204). Barone offered a "scientific" version of collectivism, demonstrating its theoretical possibility by employing marginalist analysis, at the same time trying to bring out the ideological and political neutrality that analytical technique — *i.e.* the independence of its results from any kind of ideology[25]. In fact Barone tried to separate the debate over the merits of Marxism from the economics of collectivism: "Many believe that they have confuted Collectivism when they have shown that some propositions, of Marx or of others, contain errors or contradictions" (Barone [1908b] 1935, p. 245).

Barone advocated neither market socialism nor central planning: "Hence, I do not write for or against Collectivism. ... I propose to establish certain general lines of the solution which the Ministry of Production ought to give to the vast problem with which it is faced" (Barone [1908b] 1935, p. 245). However, we think that his stated goal of formulating a scientific theory of planning independent of ideology and politics, Barone's military experience and strongly-held ideological and political views did affect his analytical work.

Understanding the context casts some light on the nature of the model and Barone's motives in formulating it. Although the model itself is very technical and mathematically based, we can say that it is not

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Production. See for example Barone ([1908a] 1936, pp. 60-63). On the other hand the *Ministry* refers to *Principi* (1908b [1935], p. 247 fn. 1, p. 252 fn. 1, p. 263 fn. 1, p. 278 fn. 1).

[25] This point is raised and dealt with by Michelini (2001, p. XCVIII).

simply a mathematical exercise extending the Walras-Pareto general equilibrium model. We take up the “Ministry” model itself in Section II.

II. BARONE’S “MINISTRY OF PRODUCTION” MODEL

Although Barone’s “Ministry” article may be considered a classic in the history of the economics of central planning in the twentieth century, it is not a stylistic masterpiece. The analysis is seldom clear, and Barone’s often chaotic notation and organization makes his analysis difficult to follow.

II.1. THE “INDIVIDUALIST REGIME”

Nearly half of Barone’s “Ministry” article deals with the individualist régime, essentially a private-property market economy where individuals own all productive resources, have property rights in their goods and resources, and are free to allocate their resources and expenditures as they see fit. Unlike the neoclassical model of perfect competition, however, his individualist model is not a single market structure: “This régime is essentially one in which free competition, monopolies and cartels are all present” (Barone [1908b] 1935, p. 247).

Tastes

Barone assumes that individual tastes are given, but he specifically excludes utility as an explanation of tastes or the household’s choice of resources supplied for income or of the goods and “productive services consumed” from income. He simply assumes that the households have chosen their best combinations at given prices.

> On [tastes] we will make no pre-supposition, no preliminary inquiry, limiting ourselves simply to assuming the fact that every given series of prices of products and productive services, every individual portions out the income from his

> services between consumption and saving in a certain manner (into the motives of which we will not inquire) by which, at a given series of prices, the individual makes certain demands and certain offers. These quantities demanded and offered vary when the series of prices vary.
>
> Thus, we disengage ourselves from every metaphysical, or subtle conception of utility and of the functions of indifference, and rely solely on the authenticity of a fact (Barone [1908b] 1935, p. 247).

There is no explanation of why or how individuals would change their choices of resources supplied and goods demanded in responses to price changes. We could, as Dooley (1998) argues, explain individual "tastes" and choice of resources supplied and goods demanded in terms of revealed preference, which does not depend on utility or utility functions.

Barone's exclusion of utility and any systematic treatment of preferences from his analysis avoids the well-known difficulties of defining aggregate social welfare with non-additive ordinal preferences. With subjective, non-additive utilities, there is nothing to "add up" to get society's economic welfare. Bergson (1938) had showed that social welfare functions depend on value judgments. Arrow's possibility theorem showed that a well-behaved social welfare function built on individual ordinal preferences would have to be "imposed" on the community or "dictatorial".

> ... [T]he Possibility Theorem can be restated as follows:
>
> *If we exclude the possibility of interpersonal comparisons of utility, then the only methods of passing from individual tastes to social preferences which will be satisfactory and which will be defined for a wide range of sets of individual orderings are either imposed or dictatorial* (Arrow 1951, p. 342).

Barone's exclusion of utility and simply assuming that individuals have already made their optimum choices of resources to supply and goods to consume allows him to define welfare in measurable and additive values of resources and goods chosen[26].

Capital, Technology and Technical Coefficients

The quantities of all types of capital are given and are the property of individual members of the community. There are *n* types of existing capital, $S,T,...,n$ and n types of new capital, $H,K,...,n$ under construction. $Q_s,Q_t,...,n$ are the quantities of existing capital.

Technology is given in the Barone model, and defines "*relations*, in a given state of technique, between the quantity produced and the factors of production" (Barone [1908b] 1935, p. 247, his italics). His technical coefficients — $a_s,a_t,\cdots b_s,b_t,\cdots$ — are the quantities of resources *R, S, ...* per unit of goods *A, B, ... ,m*, or the inverses of the average products of these resources. He initially assumes that the technical coefficients are constant and given, but shows later "that they are variable and determined by the condition of minimum cost of production"[27].

Individual Choices and Welfare

Individual choice is straightforward in Barone's Individualist Régime. Individuals supply the use of all of their capital, from which they earn income determined by the prices of capital and the quantities they supply. They then choose the quantities of goods — *including* the quantities of productive resource services (*S ,T, ...*) to "repurchase" for their own use.

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26 On this point, see Bergson (1938), Samuelson (1947), Mishan (1960) and Dooley (1998, pp. 81-84).

27 Schumpeter (1954 [1976], p. 858) argues that "[Barone] was the man who showed Walras how to dispense with constant coefficients of production".

> It is convenient to suppose ... that each individual sells the services of all his capital and re-purchases afterwards the part that he consumes directly. For example, [individual] *A*, for eight hours of work of a particular kind which he supplies, receives a certain remuneration at an hourly rate. It is a matter of indifference whether we enter *A*'s receipts as the proceeds of eight hours' labour, or as the proceeds of twenty-four hours' labour less expenditure of sixteen hours consumed by leisure[28] (Barone [1908b] 1935, p. 248).

The individuals in Barone's model have already made their constrained optimal choices of resources supplied (q_s, q_t ...) to earn income and of the allocation ("distribution") of their income among consumer goods (r_a, r_b,...), consumption of productive services (r_s, r_t, ...) and saving (e) which satisfies the budget equation

$$p_a r_a + p_b r_b + \cdots + p_s r_s + p_t' r_t + \cdots + e = p_s q_s + p_t q_t + \cdots.$$

Making *A* the *numéraire* and setting $p_a \equiv 1$, this equation is

$$r_a + p_b r_b + \cdots + p_s r_s + p_t' r_t + \cdots + e = p_s q_s + p_t q_t + \cdots.$$

If we assume that the individual has made his or her optimal choices of *r*'s and *q*'s, and if we exclude utility-maximization as an explanation, then the value of his or her optimum consumption bundle of goods is

$$\phi = r_a + p_b r_b + \cdots + p_s r_s + p_t r_t + \cdots + e.$$

Since he has excluded utility, Barone treats ϕ as a measure of individual welfare. Changes in ϕ measure changes in individual welfare. Specifically

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[28] The individual can allocate 24 hours per day between labor (n) and leisure (ℓ)—$n + \ell = 24$. At an hourly wage of w per hour of labor, then the constraint on wage income (I) and leisure is

$$wn = I$$

$$w(24 - \ell) = I$$

$$24w - w\ell = I.$$

In Barone's terms, the individual "repurchases" time to consume as leisure, for which he or she pays the opportunity cost w per hour of leisure.

$\Delta\phi > 0$ measures an improvement in welfare; $\Delta\phi = 0$ indicates maximum welfare, subject to constraints; and $\Delta\phi < 0$ measures a decline in welfare.

If we accept Barone's assertion that the value of the individual's optimum consumption bundle (ϕ) measures individual welfare, then ϕ is a cardinal magnitude, and individual ϕ's are additive. The sum of these individual welfares is aggregate or social welfare, $\Phi = \Sigma\phi$:

$$\Phi = \Sigma\phi = R_a + p_b R_b + \cdots + p_s R_s + p_t R_t + \cdots E$$

$$\Phi = \Sigma\phi = R_a + p_b R_b + \cdots + p_s R_s + p_t R_t + \cdots \frac{1}{p_e}\left(p_h R_h + p_k R_k + \cdots\right)$$

where the R's are the aggregate quantities chosen by individuals. Φ is also national income, so in Barone's model national income is a measure of aggregate welfare, and changes in national income measure changes in welfare.

By excluding "metaphysical" utility, Barone is able to aggregate *welfare* without aggregation of individual ordinal *utilities*, which is impossible. This enables him to identify the effects of economic changes on aggregate welfare in a much wider range of cases than is possible with the standard Pareto optimality criterion, but the exclusion of utility and individual utility maximization leaves him with an incomplete view of welfare.

Obviously, as in the Pareto criterion, if every individual is better (worse) off, or if at least one individual is better (worse) off and nobody else is worse (better) off, welfare has improved (deteriorated). However, by defining welfare in cardinal terms and excluding ordinal utility, Barone is also able to identify the effects of changes that make some individuals better off ($\Delta\phi > 0$) and others worse off ($\Delta\phi < 0$) (Barone [1908b] 1935, pp. 254-256). The effect on social welfare of changes that create "winners" whose $\Delta\phi > 0$ and "losers" whose $\Delta\phi < 0$ depends on the magnitudes of the gains and losses (*Ibid.*, pp. 255-256). For example, Barone argued that if costs of production fall and prices remain constant, prices exceed costs, which will generate a decline in aggregate welfare, and

> … $\Delta\Phi$ will be negative, that is to say, the individual $\Delta\phi$'s will either all be negative (*i.e.*, every individual will suffer loss) or there will be some positive and others negative, the negative preponderating. That is to say, some individuals will be benefitted, others will suffer loss; the loss to the latter will be decidedly greater than the advantage to the former, in the sense that even taking all their gain from those who have gained in the change (which takes them back to their former condition) and giving it to those who have lost by it, the latter, even with such an addition, remain in a worse situation than originally … (*Ibid.,* p. 256)[29].

In addition to comparing individual welfare gains and losses by the exclusion of ordinal utility from his analysis, the above statement resembles the Hicks-Kaldor compensation test to assess changes in social welfare from changes that help some individuals and hurt others. It also resembles A.C. Pigou's argument that redistribution of income from the rich to the poor would improve economic welfare, as long as this redistribution did not reduce national income and output, although Pigou's argument rests on an implied assumption of additive individual marginal utilities.

> The old "law of diminishing [marginal] utility" thus leads securely to the proposition: Any cause which increases the absolute share of real income in the hands of the poor, provided that it does not lead to a contraction in the size of the national dividend from any point of view, will, in general, increase economic welfare (Pigou 1932, p. 89)[30].

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[29] Also, see Samuelson ([1947] 1971, pp. 212-219).

[30] Unlike Barone, Pigou does base his comparison of welfare gains by the poor and welfare losses of the poor by comparing marginal utilities. The marginal utility of the additional share of the

However, given his views on the superiority and efficiency of an elitist bourgeois economy, Barone would never have accepted Pigou's argument that increasing the share of the poor in aggregate income would raise utility.

The Competitive Equilibrium

Barone derived the competitive equilibrium in the Individualist Régime from four systems of equations:

I. n equations that express *the physical necessities of production:* "…[T]he total of the services of existing capital must suffice for final goods and services and for the manufacture of new capital, including new working capital";

II. One "equation, which says that the excess of incomes over consumption is used in the manufacture of new capital";

III. *Costs of production: (m + n')* equations that define "the cost of production of final goods and new capital as functions of prices of productive services;

IV. *"Free competition" prices of goods and factor services:* (*m + n' -1)* equations that "expresses one of the characteristics of free competition that the price of final products and of services of new capital equal their cost of production" (Barone [1908b] 1935, pp. 249-250)[31].

Money and the *Numéraire*

Barone doesn't introduce money into his analysis until after the development of the competitive and monopoly equilbria, which makes his

National Dividend to the poor is argued to be greater than the marginal utility of the lost share of the rich. In his writings on public finance (Barone 1911-12), Barone rejects arguments for progressive taxation based the notion of additive utilities.

[31] There are $3m+2n+2n'+1$ equations in Barone's model, but only $3m+2n+2n'$ unknowns. However, like Walrás, he shows that there are only $3m+2n+2n'$ *independent* equations because "...one of the equations is the result of the others". With the number of independent equations equal to the number of unknowns, "The entire economic system is thus determinate" (Barone [1908b] 1935, pp. 250-251).

explanation more convoluted than it needs to be. Assuming good *A* as the *numéraire* was a "temporary hypothesis"

> that the merchandize *A*, instead of money be the *numéraire* (that is, that in terms of which the prices are expressed) and that one of the productive resources, *M,* already included in the equilibrium is *money*, *i.e.,* it has that special function which, in production and exchange, it fulfills independently of its numerical quality in the sense now defined (Barone [1908b] 1935, p. 264, his italics)

The price of *M* like all other prices is expressed in terms of the *numéraire* (*A)* is P_m. "For this money good … the quantity, R_m, the P_m and p_m (the price for the use of it), will be determined in equilibrium. … [There] will be definite quantity, R_a of *A*, which is both a commodity and the *numéraire"* (*Ibid.* p. 264).

He then drops the definition of *M* as money and makes *A* both the *numéraire* good and money. As we'll see, prices equal costs of production in the competitive equilibrium, so P_m, the cost of production of money, is the cost of production of *A,* $P_m = p_a \equiv 1$.

"Maximum Competition", Profits and Welfare

Barone argued that profit, "in which there is an element in addition to wages of management" is "… a differential gain [which] appears as soon as the competing entrepreneurs are *not* manufacturing under the same conditions …" (Barone [1908b] 1935, p. 251). His explanation of profit as a "differential return" suggests that economic profit is a form of rent to the entrepreneurs with superior abilities or in superior circumstances.

> … [B]esides the technical relations between the technical coefficients, there are, for each entrepreneur, special *economic* relations, based either on the want of ability to

> discern and to put into action a plan which combines the technical coefficients to the greatest economic advantage, or on the impossibility of arranging that combination of maximum advantage because of the limitation on the available supply of some factor. Hence, originates the *transitory* profit of various enterprises, even in static conditions (*Ibid.*, p. 252, Barone's italics).

This passage suggests some form of active entrepreneurship, and profit as a return on entrepreneurial activity[32]. However, there is no place in his analytical model for this because he starts with all optimal choices having been made, and there is no room for making exchanges and therefore no role for entrepreneurial search for unrealized profit opportunities.

Barone defines the limiting case of free competition, or the "maximum of free competition'" as one "… in which there are one or more competing entrepreneurs who make no profit and who produce at the same cost" (*Ibid.*, p. 252). Of course, a single "competing entrepreneur" makes no sense, unless we consider the potential competition from potential entrants. And this is exactly Barone's case: in a natural monopoly, which in other works he defines perfectly[33], the firms "left on their own, arising from competition, will always have to fear *potential* competition … from other similar firms that could spring up" ([1908a ed. 1909] 1936: 289)[34]. Presumably, Barone's 'maximum' free competition could include a few competing firms producing at the same cost and making no profit, or even just one threatened by potential competitors,

[32] In many others writings Barone sees competition as a strategic activity, which implies that the firms he considers are not price takers.

[33] See for example Barone ([1908a] 1936: 25): "In some cases it is … the question of the most economic size of the firm which leads, through competition, to one single firm". This subject is dealt with in Mosca (2008).

[34] Mises ([1949] 1996: 276) used railroads as an example of an apparently natural monopoly with very large sunk costs that faces competition from another industry (automobiles and airplanes): "The bigness and economic 'power' of the railroad companies did not impede the emergence of the motor car and the airplane". See Bradley (2010: 254-257).

suggesting contestable markets rather than the standard perfectly competitive model[35]. However, like all competitive general equilibrium states, there is no active competition among firms because his discussion begins with the system in equilibrium[36].

In his model of free competition, Barone assumes a system of technical coefficients that "… are determined in such a manner that the costs of production may be at a minimum; and this case also, as that of the price being equal to the cost is characteristic of free competition" (*Ibid.,* p.253). If these coefficients minimize average cost, then they also equal marginal cost. Since he has relaxed the assumption of constant given technical coefficients, this suggests that these coefficients define the minimum point on the firm's average cost curve. It is interesting, then, that Barone's graphic analysis of the firms does not include average cost curves at all since Barone clearly explained that the average costs curve is U shaped (Mosca 2005, p. 3) in his *Principi* (Barone 1908a), but he did not include them in his graphic analysis in his "Ministry" model.

There are no big surprises in Barone's general equilibrium with "maximum of free competition." All entrepreneurs will produce where profit is maximized. For example, in the production of *B*, profit is $Q_b(p_b - \pi_b)$, where p_b is the price of *B*, π_b is the average cost of *B*, and Q_b is the output of *B*. If we follow Barone's assumption of constant p_b and π_b, each entrepreneur will maximize profit where

$$Q_b'(p_b - \pi_b) = 0$$
$$p_b - \pi_b = 0$$
$$p_b = \pi_b$$

[35] In William Baumol's contestable market model, *perfect* contestability is possible with a minimum of two firms that need not be price takers. Perfect contestability and potential competition from entrants ensure that even duopolists will produce where $P = MC = \min AC$. See Baumol (1982). A less technical summary is in Bradley (2010, pp. 248-254).

[36] This is true only for his formal model, and not for his verbal explanations.

With constant price and technical coefficients equal to minimum average cost price equals marginal revenue, $p_b \equiv MR(Q_b)$, and average cost is also marginal cost, $\pi_b \equiv MC(Q_b)$.

The entrepreneurs thus maximize profit at an output of *B* where $MR(Q_b) = MC(Q_b)$. Although the technical coefficients are "variable", Barone states that

> ... [T]he system in which the technical coefficients are determined in such a manner that the costs of production may be at a minimum; and this case also, as that of price equal to the cost is characteristic or free competition (Barone [1908b] 1935, p. 253).

This gives us the familiar condition for competitive long-run equilibrium where

$$p_b \equiv MR(Q_b) = MC(Q_b) \equiv \pi_b,$$
$$profit = Q_b(p_b - \pi_b) = 0.$$

Barone then (*Ibid.*, p. 254) derives the differential of aggregate welfare as $\Delta\Phi = \Sigma R(\Delta\pi - \Delta p)$. From this, it is obvious that in the competitive equilibrium $\Delta\Phi = 0$, and Φ is at a maximum if $\Delta\pi - \Delta p$[37].

> Consequently, precisely by virtue of the conditions which are characteristic of free competition (that is, the cost of production equals the prices and the costs of production are at a minimum) given the quantity of services available, the partial differential of Φ *when prices are considered constant is zero* (*Ibid.*, p. 254).

This is the essence of the fundamental theorems of welfare economics — that every perfectly competitive general equilibrium is a Pareto optimal state of the economy, and that a Pareto optimal state of the economy is a perfectly competitive equilibrium[38].

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[37] However, this is the necessary condition for a local maximum, not necessarily a global maximum.

[38] See Dorfman, Samuelson and Solow (1958, p. 401 *fn* 1).

However, Barone's conclusion goes further than Pareto optimality. Having dismissed utility as an explanation of value Φ measures welfare and $\Delta\Phi$ is a change in welfare. In other words, in his analysis, $\Delta\Phi > 0$ means that society's economic welfare has improved, even if some individuals are worse off. Pareto optimality identifies only an efficient state and that other states cannot be shown to be better or worse for society without value judgments.

Barone takes pains to avoid the mistaken view that the competitive equilibrium is best for everybody or that competition necessarily allows "every individual, with the services at his disposal, ... a higher scale of choice than that which is possible with any other régime" (*Ibid.*, p. 257). His explanation of the meaning of the "maximum" implies Hicks-Kaldor compensation tests.

> The maximum ... simply means this: that by substituting other conditions for one or more of the characteristics of free competition (minimum costs of production, equality of prices and costs of production) the conditions of *all* could not be improved. On the contrary, if some are benefited by this substitution, their gain is less than the loss of those who suffered. So that if all their gain is taken from those who gained by the substitution, and is given to those who suffered loss by it, the latter could never retain their former position and some would always remain losers (*Ibid.*, p. 257).

One of the difficulties in using compensation tests to identify actual welfare changes, of course, is that they typically deal only with *potential* compensation of losers by winners from an economic change. Although Barone has evaded the messy questions of non-comparable preferences by identifying welfare in terms of Φ, it would still require a value judgment to say that *potential* compensation identifies changes in aggregate social welfare.

Partial Analysis and Demand Curves

In Barone's model, as in those of Walras and Pareto, the demands for goods are interdependent. The response of the quantity of good *B* demanded to a change in p_b, for example, depends on the effect of changing p_b on all other prices and on saving. Barone isolates the relationship between p_b on *B* demanded by assuming

> … an intermediate period between one equilibrium and another, in which p_b alone varies, with the consequential changes of the *R*'s, without the movement of variation being transmitted by p_b to all other prices. Then for the small variations in p_b we could hold
>
> $$dR_b = \frac{\partial R_b}{\partial p_b} dp_b .$$
>
> That partial derivative is generally negative, as experience shows. Whence arises the conception of a small movement along *the smooth curve of demand* on either side of the position of equilibrium (*Ibid.,* p. 257).

In short, holding all other prices and quantities constant and varying p_b generates a negatively sloped demand curve. Note that Barone's only explanation for this property of demand curves is that "experience shows" that generally demand curves are negatively sloped. Having excluded utility and marginal utility, he has no explanation of demand curves as the outcome of utility-maximizing choices in response to changes in price. In "maximum" free competition, individual enterprises are too small relative to the market to affect the price[39].

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[39] It is clearer to consider the inverse demand curve, $P_b(R_b)$, the slope of which, using Barone's notation, is

$$dp_b = \frac{\partial p_b}{\partial R_b} dR_b < 0.$$

For a price-taking individual $\partial p_b / \partial r_b = 0$, and

Monopoly, Profits and Welfare

The economy of Barone's Individualist Régime, as explained earlier, includes monopolies and cartels as well as free competition. Barone attributed monopoly to unlimited economies of scale (natural monopoly), limited quantities of resources, and other entry barriers[40]. In addition to monopolization of a market by a single firm, he also included cartels as a form of monopoly. Most of his analysis of monopoly in his "Ministry of Production" article was "of a single entrepreneur manufacturing a product and a single seller of a productive service" (Barone [1908b] 1935, p. 260). His analysis of monopoly and its impact on welfare is straightforward and familiar.

Like the entrepreneurs in freely competitive markets, the monopolist seeks to maximize its profit. If the market for *B* is monopolized, the monopolist will produce R_b to maximize $(p_b - \pi_b)R_b$. Barone assumes that monopolization does not affect cost, and that the monopolist is a price taker in the purchase of inputs ("services").

> If, as is the most general case, he can act only on the selling price of the product and not at all on the cost of production (because he is obliged to accept the prices of services as they are and cannot influence them directly) ..., then, to obtain his maximum profit, he must consider p_b and R_b as variables (the latter as an independent variable and p_b as a constant) (*Ibid.,* p.261).

The necessary condition for profit maximization is the same for a monopolist as for competitive firms — $MR(R_b) = MC(R_b)$. Since Barone assumes that average cost, p_b, is constant then $\pi_b = MC(R_b)$. However,

---

$$dp_b = \frac{\partial p_b}{\partial r_b} dr_b = 0.$$

[40] See Dooley (1998) and Mosca (2005 and 2008) for short summaries of Barone's explanation of the sources of monopoly.

"In the case of monopoly, ... by changing *R* the respective *p* can be influenced" because the monopoly faces a negatively sloped demand market demand curve — $\partial p_b / \partial R_b < 0$. Barone ([1908b] 1935, p. 261) then states the necessary condition for maximum profit as

$$p_b - \pi_b + R_b \frac{\partial p_b}{\partial R_b} = 0 \; or \; p_b + R_b \frac{\partial p_b}{\partial R_b} = \pi_b.$$

We know that $p_b + R_b \frac{\partial p_b}{\partial R_b} = MR(R_b)$[41], so Barone's condition for maximizing profit is the familiar $MR(R_b) = MC(R_b)$.

Barone concluded that monopolization of a competitive industry would lower economic welfare (Φ), or "destroy wealth". Going back to his restatement of change in welfare as $\Delta\Phi = \Sigma R(\Delta\pi - \Delta p)$, and monopolization would raise *p* but not alter π, then obviously monopolization would generate $\Delta\Phi < 0$. He also showed the effect of monopoly on welfare graphically.

Figure 1 below is a modification of Barone's monopoly diagram (Barone [1908b] 1935, p. 263). We have labeled the inverse market demand (p_b) and added the marginal revenue curve (the broken line), which is absent in Barone's diagram.

Figure 1

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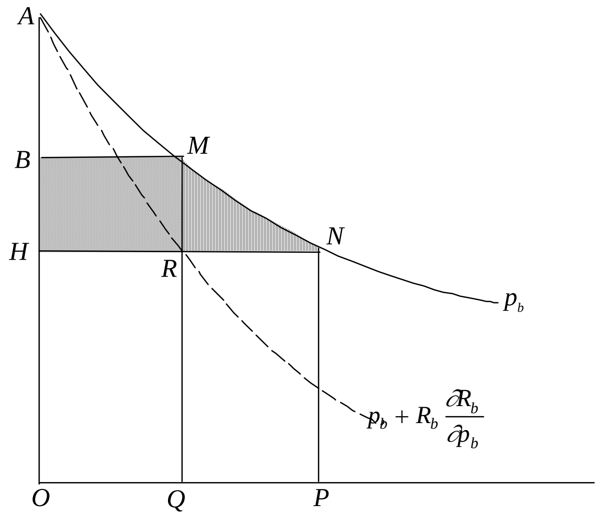
41 $MR(R_b) = \frac{\partial}{\partial R_b} p_b R_b = p_b + R_b \frac{\partial p_b}{\partial R_b} < p_b.$



The competitive equilibrium output is *OP*, and the equilibrium price equals average and marginal cost (*OH=PN*). Economic profit is zero and consumer surplus is *HAN.*

If the industry is monopolized, the monopolist faces the inverse demand (p_b) and its marginal revenue is less than price at every output. The monopolist maximizes profit at an output of *OQ,* which determines the monopoly price of *OB=QM.* Consumers lose consumer surplus of *BMNH,* of which *BMRH* is redistributed from consumer surplus to monopoly profit and *MRN* is a deadweight loss. This, Barone concludes, generates a welfare loss because the monopolist gained less than the consumers lost. He calls this a "destruction of wealth."

> … [M]onopolies and syndicates create a difference from the equilibrium of free competition which may be described as a destruction of wealth, in the sense that if some (the monopolists) obtain a profit by it, others (consumers) lose more … There would have been less disadvantage to all if *BMRH* had been taken away directly and been given freely to the monopolist, leaving production as before: the destruction of *MRN* would have been avoided (*Ibid.*, p. 263).

Barone is correct that monopoly generates a deadweight loss, because the monopoly must maximize profit with $P > MR = MC$.

II.2. THE COLLECTIVIST RÉGIME

Barone's Collectivist State is neither a science fiction Utopian dream nor an oppressive Stalinist dictatorship. In fact, he is silent on the political system of the Collectivist State beyond assuming that the Ministry of Production has the sole authority to allocate resources so that aggregate social welfare is maximized. His goal was to formulate a model of "scientific collectivism" that is neutral ideologically and strategically (Barone [1908b] 1935, p. 266).

The problem facing Barone's Ministry of Production is essentially the problem facing the Individualist Régime: "to solve the problem of combining … individual and collective services in order to procure the *maximum welfare* of its people" (Barone [1908b] 1935, p. 265). His analysis of the Individualist Régime began with the economy in equilibrium and welfare (Φ) at its maximum. Similarly, his analysis of the Collectivist Régime begins *after* the Ministry has solved the welfare maximization problem.

> The Ministry has studied the very complex problem and has solved it, on the basis of a certain formula of distribution which has been established by the community, on certain ethical an social criteria, with which we do not propose to concern ourselves directly (*Ibid.,* pp. 265-266).

However, later in the article, Barone argues that the equations necessary to maximize welfare cannot be solved *a priori*, but must be solved by *ex post* trial and error or by large-scale "experiments" (*Ibid.,* pp. 286-289). Apparently, in Barone's model, the Ministry has made all of the trial-and-error adjustments and/or conducted the experiments to reach the optimal solution, and his analysis shows the conditions that must be satisfied for this result.

Individual and Collective Resources

In Barone's Collectivist State, some resources $(M,N,...,\ell)$ are owned by individuals. The remaining resources $(S,T,...,(n-\ell))$ are collectively owned and under the authority of the Ministry (*Ibid.*, p. 265).

Money, Equivalents and Shadow Prices

Barone assumes that there is no money and no prices in the collectivist régime,

> ... but the Ministry maintains, for no other purpose than the social accounts, some method of determining ratios of *equivalence* between the various services and between the various products and between products and services (*Ibid.,* p. 267).

These equivalents (λ_i) define the rates at which goods, consumed productive services and resources exchange with each other. With *A* as the *numéraire,* $\lambda_a = 1$, these equivalences are

$$1, \lambda_b \cdots \lambda_m, \lambda_n \cdots \lambda_s, \lambda_t \cdots$$

Barone's equivalences are, of course, shadow prices. For good *B,* for example, "the equivalent of *B* (which is afterwards the *price*, under a different name, expressed in terms of that special kind of work which is called the *goods*)" (Barone [1908b] 1935, p. 272)[42]. Moreover, as

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[42] If $\lambda_a a$ is equivalent to $\lambda_b b$ in exchange at the socialized shops, then

$$\lambda_b b = \lambda_a a$$

$$\frac{\lambda_b b}{\lambda_a b} = \frac{\lambda_a a}{\lambda_a b}$$

$$\frac{\lambda_b}{\lambda_a} = \frac{a}{b},$$

which is analogous to p_b / p_a in the Individualist Régime. If we let the equivalent of the *numéraire*/money be $\lambda_a \equiv 1$, then explained earlier, he defines good A as both the *numéraire* and as money. Even though he assumed that prices and money are absent in the Collectivist Régime, he proceeds with the λ's playing the role of prices and A playing the role of money[43].

Income from Collective Resources

The income from the collectively owned resources (S, T, ...) evaluated in their equivalents or *de facto* prices is

$$X = Q_s\lambda_s + Q_t\lambda_t + \cdots.$$

The Ministry can distribute X among individuals "indirectly" by setting the prices of collective enterprises equal to zero which would lower the prices of goods produced, or "directly" by allocating every individual an income supplement of γX. The Ministry could give every individual an equal share of X or it could differentiate γ and γX by "classes," as long as $\Sigma\gamma = 1$, which would be more consistent with Barone's elitist ideology — his *collectivist state* need not be an *egalitarian state.* Barone argued that the direct distribution would generate higher efficiency and welfare than the indirect distribution.

> ... [E]ven when some resources are collective property, the State can do no less than fix a price for their services, since there would be an enormous waste of these, with a consequent destruction of wealth ... This is the correct and fundamental argument against indirect distribution and in favour of direct distribution: the impossibility of obtaining a

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$$\lambda_b = \frac{a}{b}$$

is analogous to p_b in the individualist model.

43 Mises ([1920] 1935, p. 92) argues that

> ...[T]he socialist state will thus afford room for the use of a universal medium of exchange — that is, of Money. Its rôle will be fundamentally the same as in a competitive society; in both it serves as the universal medium of exchange. Yet the significance of Money ... will be, in fact incomparably narrower, since the material available for exchange ... will be confined to consumption-goods.

> maximum as high as that which could be achieved with the latter method (Barone [1908b] 1935, p. 274).

The inefficient allocation of capital in the absence of a capital market and a scarcity interest rate for the use of capital in the administrative allocation of capital in Soviet planning clearly supports Barone's argument on the superiority of direct distribution of *X*.

Individual and Collective Welfare

Individuals in the Collectivist State are free to make the same choices as those in the Individualist Régime. Each individual makes the best choice of *r, q,* and *e,* subject to the constraint

$$r_a + \lambda_b r_b + \cdots \lambda_s r_s + \lambda_t r_t + \cdots + e = \lambda_m q_m + \lambda_n q_n + \cdots + \gamma X\,.$$

The major departure from the individualist model is the individual's income supplement γX from the collectively owned resources.

As in the individualist model, Barone excludes utility from his analysis by assuming that the individuals have chosen their optimal quantities of consumer goods and productive services consumed and saving (*r*'s, *q*'s and *e*). The individual's welfare from goods, productive services and saving in the Collectivist Régime is θ, and analogous to ϕ in the Individualist Régime — *i.e.,*

$$\theta = r_a + \lambda_b r_b + \cdots \lambda_s r_s + \lambda_t r_t + \cdots + e.$$

Changes in individual welfare are

$$\Delta\theta = \Delta r_a + \lambda_b \Delta r_b + \cdots \lambda_s \Delta r_s + \lambda_t \Delta r_t + \cdots + \Delta e.$$

Since he eliminated utility and utility-maximization, individual θ's can be aggregated, again analogous to Φ as an aggregation of individual ϕ's — *i.e.,*

$$\Theta = \Sigma\theta = R_a + \lambda_b R_b + \cdots \lambda_s R_s + \lambda_t R_t + \cdots + E$$

and changes in aggregate welfare as

$$\begin{aligned}\Delta\Theta = \Sigma\Delta\theta &= \Delta R_a + \lambda_b \Delta R_b + \cdots \lambda_s \Delta R_s + \lambda_t \Delta R_t + \cdots + \Delta E \\ &= \Delta R_a + \lambda_b \Delta R_b + \cdots \lambda_s \Delta R_s + \lambda_t \Delta R_t + \cdots + \Delta_h \Delta R_h + \Delta_k \Delta R_k + \cdots\end{aligned}$$

where Δ_h and Δ_k are saving per unit of *H, K, ...* manufactured (Barone [1908b] 1935, p. 271). The implications of $\Delta\Theta$ in the Collectivist State for welfare are essentially the same as the implications of $\Delta\Phi$ in the individualist economy. Social welfare is at a local maximum where $\Delta\Theta=0$. Any move away from this state will cause $\Delta\Theta<0$ and a deterioration of welfare.

The Ministry in Barone's model begins with a random series of technical coefficients, and then makes adjustments until $\Delta\Theta = \Sigma\Delta\theta = 0$. This will occur when the shadow price, or equivalent, of each good (*B* for example), λ_b, equals its cost of production (*Ibid.,* p. 272). Given the shadow prices (λ's) for resources (*S, T, ...*) and the technical coefficients for the input of *S* and *T* per unit of *B*, Barone expresses the change in aggregate welfare $\Delta\Theta = \Sigma\Delta\theta$ from a change of output of *B* of ΔB as

$$\Sigma\Delta\theta = \lambda_b \Delta R_b - (\lambda_s b_s + \lambda_t b_t + \cdots)\Delta R_b = 0$$
$$\lambda_b = (\lambda_s b_s + \lambda_t b_t + \cdots).$$

Barone also showed that the shadow prices on additional new resources, he uses *H* as an example, also would have to equal cost of production to achieve maximum collective welfare (*Ibid.*, p. 273). For example, increasing *H* by Δ_h will generate a change in welfare of

$$\Sigma\Delta\theta = \Delta_h \Delta R_h - (\lambda_s h_s + \lambda_t h_t + \cdots)\Delta R_h = 0$$
$$\Delta_h = (\lambda_s b_s + \lambda_t b_t + \cdots)$$

Next, Barone deals with variable technical coefficients — b_s and b_t per unit of *B,* for example. Resources *S* and *T* will be substituted until cost is minimized. As long as factor substitution improves efficiency and lowers cost, $\Sigma\Delta\theta > 0$ and welfare improves. However, with diminishing returns these coefficients vary inversely with amounts employed. Given the shadow prices λ_s and λ_t for resources *S* and *T*, resources will be substituted until

$$\Sigma\Delta\theta = \lambda_s \Delta b_s + \lambda_t \Delta b_t = 0$$
$$\lambda_s \Delta b_s = -\lambda_t \Delta b_t$$
$$\frac{\lambda_s}{\lambda_t} = -\frac{\Delta b_t}{\Delta b_s},$$

or the ratio of shadow prices of resources *S* and *T* equals the marginal rate of technical substitution, which Barone correctly points out "is one of the conditions of the λ_b minimum, when the *economic* variability of the technical coefficients is considered" (*Ibid.,* p. 273).

Barone then concludes:

> That the Ministry of Production in this perfecting of its first approximate and indeterminate solution (the sole criterion of perfection being the maximum collective welfare) comes to the conclusion that production should be so organized that (with the systems of technical coefficients, of the λ's and *R*'s) *the cost of production may be minimized* and that the *equivalents for the products* and *for the additions of capital may be such as will correspond to their respective costs of production.*
>
> That the system of equations of the collectivist equilibrium is none other than that of the free competition (*Ibid.,* p. 274, Barone's italics).

This is the essence of the "competitive solution" for equilibrium in later market socialist economics. For example, Oskar Lange argues that given prices that reflect the Central Planning Board's preference scale,

> The Central Planning Board has to impose on the managers and builders of plants the rule that factors of production should be combined so as to minimize the average cost of production. For each plant and each industry the rule must be adopted to produce exactly as much of a commodity as can be "accounted for" at a price equaling marginal cost; and

> on the managers of ultimate productive resources the rule must be imposed to direct these resources only to the industries that can "account for" the price fixed by the Central Planning Board (Lange [1938] 1964, pp.91-92).

Profits of State Monopolies

In Barone's Collectivist State, presumably the Ministry of Production would eliminate artificial entry barriers that perpetuate monopolies. However, economies of scale could result in natural monopolies or high levels of concentration if the optimum firm size is large relative to market demand. Barone was critical of "excessive" numbers of inefficiently small firms in an industry, and argued that allowing a natural monopoly was preferable to inefficient production by smaller than optimal size firms. He makes this point clearly in his *Principi:*

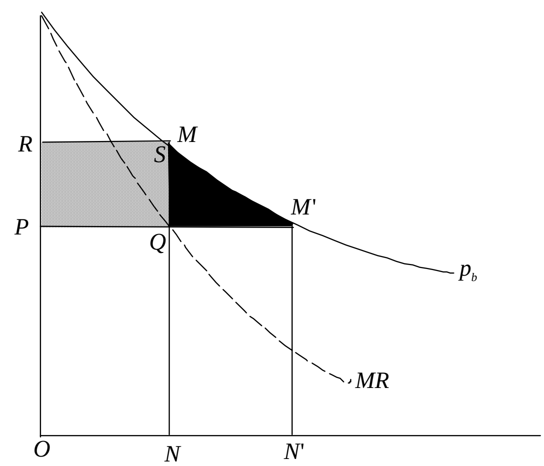
> it happens that, ... because competition does not operate sufficiently, this maximum size of firms is not reached — and hence the number of these is not reduced to that minimum to which corresponds the lowest cost of production" (Barone [1908a] 1936, pp. 288-289).

However, Barone overlooks the fact that if economies of scale generated monopolies or highly concentrated industries in which firms have significant market power, and if these monopolies were free to set their own prices to maximize their profits, these prices will exceed marginal and average cost and the firms will realize an economic profit. As in the individualist case, this will generate a deadweight loss — or, in Barone's terms, "destruction of wealth".

Moreover, the profits of state monopolies are the collective property of the community and not the managers of the monopolies, so it is necessary to distribute these monopoly profits to individuals. Barone departed from his preference for direct distribution of state income to argue that indirect distribution, in the form of setting price equal to minimum average cost (and, therefore, marginal cost) would be superior (Barone [1908b] 1935, pp. 280-284).

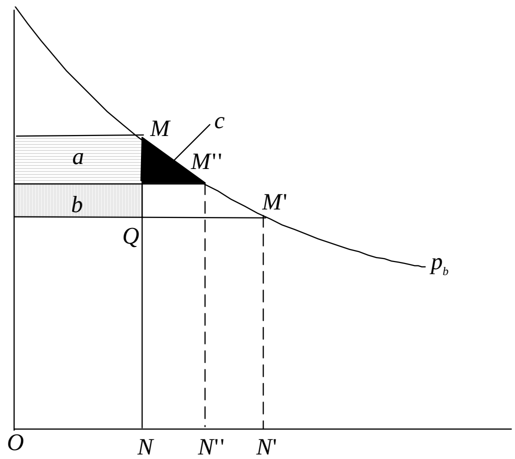
Barone's argument is presented in Figure 2, which is a modification of his graph (Barone [1908b] 1935, p.280). As in Figure 1, above, we have labeled the inverse demand curve and added the *MR* curve, which is absent in Barone's diagram. The monopolist's equilibrium output is *ON*. It charges a price of *OR* and realizes a profit of *RQSP*. If *RQSP* were distributed directly to individuals, output would remain at *ON*. However, if monopoly profits were redistributed to the community *indirectly* by lowering the price to average cost, output would increase to *ON'* and individuals would realize additional consumer surplus of *MM'Q*, or the sum of the cross-hatched and black areas in the diagram. If average cost fell with output, the case for indirect distribution with price equal to average cost is more compelling because it would result in a greater gain in consumer surplus.

Figure 2



However, if average cost rises with output, the superiority of direct or indirect distribution depends on the difference between the gain in consumer surplus from increasing output and the loss of consumer surplus from higher costs. For example, Figure 3 is a modified version of Barone's rather cryptic Fig. 6 (*Ibid.,* p.281).

Figure 3



With rising *AC,* lowering the price to cover *AC* no longer moves output to *N',* as it did in Figure 2, but to *N''.* If the original profit were distributed directly, individuals would receive areas *a* and *b.* With indirect redistribution by charging price equal to *AC,* individuals receive areas *a* and *c.* Whether individuals receive larger income supplements by direct or indirect distribution of profits in this case depends on the sizes of areas *b* and *c.*

Although he showed the potential superiority of indirect distribution of the profits of state monopolies, Barone thought that the Ministry might well choose to stick to a rule of direct distribution. First of all, he thought that

> ... as experience shows, the total sum of these profits is in reality unlikely to be large (there are losses as well as profits); and it will still be necessary to use a part of profits as remuneration for the work of those people who as

> assistants in the Ministry, are engaged in endeavouring to keep the cost of production as low as possible; and lastly ... indirect distribution implies a loss of freedom — curtailing the liberty of giving to the γ's the most advantageous from ethical and social aspects (*Ibid.*, pp. 281-282).

In addition to these considerations, Barone thought that the Ministry could stick with direct distribution of monopoly profits of state enterprises to avoid adding to "a multitude of complications arising out of the *practical* resolution of the equations of equilibrium" (*Ibid.*, p. 282).

Saving, Capital Formation, and the Productivity of Capital

Barone attacked the orthodox Marxist argument that only labor power (variable capital) generates surplus value and that capital is unproductive. He argued that the productivity of capital is a "purely *objective* technical fact" (*Ibid.,* p. 278). The additional output generated by capital exceeds amortization. The easiest way to clarify his explanation is to let the output of *B* from $(R_s + R_s')$ of resource *S* and $(R_t + R_t')$ of resource *T* be

$$R_b\left[(R_s + R_s'),(R_t + R_t')\right] = R_b + R_b'.$$

If the community then reduces its consumption of *B* by R_b' and uses the freed resources R_s' and R_t' to produce new capital R_k which it subsequently employs to produce *B,* the quantity of *B* rises to $\overline{R}_b$ — *i.e.,*

$$R_b(R_s, R_t, R_k) = \overline{R}_b.$$

The new capital, R_k depreciates at an annual rate of ε, so maintaining $\overline{R}_b$ in the future requires replacement investment of $\varepsilon(k_s + k_t)R_k$, where k_s and k_t are the quantities of *S* and *T* per unit of *K.* The new capital (R_k) is productive, Barone argues, because

> ... with the choice of an appropriate method $\overline{R}_b > R_b + R_b'$, which makes it possible to pay a "premium" of

$$\frac{\overline{R}_b - (R_b + R_b')}{R_b'}$$

per unit of foregone consumption of B (R_b') to finance new capital investment (Barone [1908] 1935, p. 278).

If we interpret the "premium" paid by the Ministry as the interest rate, Barone has essentially explained the interest rate in the Collectivist State in terms of the productivity of capital.

Individual and Collective Saving

Barone argued that saving and investment are essential if the collectivist economy is to maintain and expand its capital stock to generate growth of output and improve future welfare. If the Ministry determines that individual preferences lead to inadequate saving for capital formation and future consumption, perhaps because they place too little weight on current consumption relative to saving to finance investment in new capital and generate future growth, it will have to specify the rates of saving and investment.

Barone then distinguishes between *E,* the saving determined by the Ministry for capital formation and future consumption, and individual voluntary saving, E_i. He argued that the Ministry should deduct E before distributing X (*Ibid.*, p. 279). The individual's choice equation then becomes

$$r_a + \lambda_b r_b + \cdots \lambda_s r_s + \lambda_t r_t + \cdots + e_i = \lambda_m q_m + \lambda_n q_n + \cdots + \gamma(X - E),$$

where e_i is the individual's voluntary individual saving and $\gamma(X\text{-}E)$ is the individual share of the income from collectively owned resources after deduction of E as saving by the Ministry. Aggregating these for all individuals,

$$\begin{aligned} & R_a + \lambda_b R_b + \cdots \lambda_s R_s + \lambda_t R_t + \cdots + E_i + E \\ & \quad = \lambda_m Q_m + \lambda_n Q_n + \cdots + \lambda_s Q_s + \lambda_t Q_t + \cdots. \end{aligned}$$

The short time horizons of individuals and their "excessive" weight on current consumption over growth and future consumption is a common socialist justification for the planners' determining saving and investment. For example, Maurice Dobb (1969, pp. 216-217) argues:

> Another … case of consumers' fallibility, much commented upon, is the widespread tendency of individuals to discount future satisfactions compared with present satisfaction … This has principally been adduced as a reason why the rate of investment in a socialist economy must be a social, or governmental, decision, bearing no necessary relation to the time-preferences of individuals (as some statements of optimum conditions imply that it should).

Even though Barone does not appear in the text, citations, or index in Abba P. Lerner's *Economics of Control* (Lerner 1946), his justificaton of planners determining investment comes close to Barone's.

> The collectivist authority … has to make the important decision of dividing the resources of society between satisfying current consumption and increasing productive equipment. When it has made this decision, the rate of investment is given and there is also a definite … marginal yield from postponement of output which determines the appropriate rate of interest … There is no certain way, in a collectivist economy, of permitting the consumers, *as consumers,* to make this decision via the price mechanism (Lerner 1946, pp. 262-263).

Of course, if the decision to invest is made by the central authority, it follows that the authority should also make the collective saving decision to finance this investment.

As a theoretical piece, it would be unreasonable to expect Barone's essay to deal in much detail with the institutions of the Collectivist State. He doesn't even say much about how the Ministry would work. He is completely silent on the political system in the Collectivist State. If we interpret Barone's "Ministry" essay as simply a theoretical exercise to illustrate the applicability of the Pareto/Walras general equilibrium model to a collectivist economy[44], we wouldn't expect much institutional detail in an abstract analytical piece. However, this leaves Barone's Collectivist State rather bloodless and overlooks Barone's own strong political and ideological views that affected his analytical work. Much of the debate from the 1930's through the 1950's over economic calculation and socialism as a political and economic system, including Barone's "Ministry" article, has little to say on these matters.

III. THE IMPACT OF BARONE'S "MINISTRY" MODEL

We now move on to examine the impact of the "Ministry" on Italy first, and then on the later development of socialist economics.

Despite the esteem which Barone enjoyed among contemporary economists, in Italy and abroad[45], apparently the initial interest in his essay was slight[46]. On the one hand not even Barone's *Principi* met with much luck[47], on the other in Italy the subject of the comparison between market and planned economic systems after 1917 was in general neglected (Michelini 2001, p. CXXV).

Moreover, as we already said, many of the ideas in Barone's "Ministry" come from Pareto. This is not the only occasion where Barone is interpreted as a systematizer of Pareto's ideas, it is something of a *cliché* extended to his entire work, and which has been put forward

[44] We wish to thank Professor Gary Mongiovi for offering this comment in his remarks on an earlier version of this paper presented at the 2008 Conference of the History of Economics Society in Toronto.
[45] Faucci (2002, pp. 196-199) recalls Barone's relationship with Pareto, Pantaleoni, and Walras.
[46] He was not understood by economists such as Ricci, Del Vecchio, Mortara, Einaudi, or Caffè (Faucci 2002, pp. 189-194).
[47] Michelini (2007, p. 384) recalls that between 1908 and 1924 (the year of Barone's death) there were rare and not very significant references to his *Principi*.

repeatedly for a long time[48]. In the case of the "Ministry" this *cliché* was probably what led economists to underestimate its theoretical originality[49]. Nevertheless, studies from the 1920s have been found that derive from Barone, even citing him together with Pareto, in the debate on the war economy[50].

The thesis of Barone's subaltern position with respect to Pareto has been refuted precisely with reference to the "Ministry of Production": by comparing point by point the contributions of both, the line has been traced where "Barone as systematizer ends and Barone the innovator, or better anticipator, begins" (Petretto 1982, p. 149). For Barone a path breaking role emerged, not so much in the foundation of the new welfare economics, in which Pareto still plays a more important role, as in the development of the theory of the efficient allocation of resources according to its formulation after the 1950s[51].

The publication of an English translation as Appendix A in Friedrich von Hayek's classic edited volume, *Collectivist Economic Planning* (Hayek 1935)[52], gave Barone and his essay much more international recognition. From that moment he has always been referred to in the literature on economic planning, and this has led to a focus on the "Ministry" that seems even exaggerated when compared to the rest of his extraordinary scientific production[53].

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[48] Barone himself is perhaps responsible for this, encouraging people to interpret his contributions in this way. See for example his preface to the first edition of his *Principi*: "on every page of this text can be [found] the influence exercised on me especially by the magisterial books of Vilfredo Pareto" (Barone [1908a] 1936, p. 7).

[49] Evidence of this, for example, is in the words of Spinedi, who calls it "an old problem Pareto already solved" ([1924] 1977, p. 119) and of Del Vecchio, according to whom "we are dealing with … the formal perfecting of theories already known" ([1925] 1977, p. 125).

[50] Michelini (2005, pp. 790-791) recalls the exchange between Cabiati, in favor of the nationalization of the industries of war production, and Prato, on free market positions even in times of war.

[51] Petretto (1982, p. 151) refers to the line of Arrow, Debreu, Koopmans, and Malinvaud.

[52] Probably Hayek got to know of the "Ministry" from Schumpeter's introduction to the 1927 German edition of Barone's *Principi*, in which the 1908 article is cited in the notes and much praised by Schumpeter (Gentilucci 2006, p. 205).

[53] This focus is most certainly due to the lack of translations into English of other works of Barone.

Barone's "Ministry" article is often cited as the opening shot in the calculation controversy over central planning. He did address the central issues of the calculation controversy, but the time of the publication of the volume edited by Hayek in 1935 the calculation debate was in full swing, so it is not clear what impact Barone's "Ministry" model had on the debate itself.

Barone is often characterized as a market socialist and/or an advocate of central planning. For example, Arrow (1994, pp. 6-7) refers to "the market socialists, from Enrico Barone through Oskar Lange and Abba Lerner". However, Barone's influence on the market socialist literature of the 1930s and 1940s is questionable. Barone is not mentioned and his name does not show up in the references or index of Abba Lerner's *Economics of Control* (Lerner 1946, p. 195). Unlike Lange, Lerner, Taylor, and the later market socialists, Barone was more interested in the theoretical possibility of a "collective maximum" in a collectivized state than prescribing institutions, policies, and rules that would accomplish this goal, beyond such general policies of direct over indirect redistributions.

CONCLUSION

Our article addresses the question of why Barone wrote his *Ministry* essay. As we said, in addition to showing the great potential of marginalist techniques, he wanted to demonstrate the theoretical possibility of the collectivist régime, the reappearance in a régime of this kind of the same categories as the market economy, and the impossibility of economically efficient collectivism in practice. Our analysis of Barone's model in Part II clarifies the first two points, while the last one deserves more attention.

In his article it is clear that Barone had serious doubts about the practical possibility of the Ministry of Production actually achieving a "collective maximum". He refers to the Ministry's task as "vast", and argues that the equilibrium equations could not be solved *a priori*, but would require large scale "experiments". To grasp Barone's thinking on this point, it may be useful to illustrate some examples in which the figure of the Ministry appears in his later works.

In 1909 he writes again that the technology that minimizes costs would be discoverable, also by the Ministry, only by trial and error[54]. Actually, in a later essay on trusts, he explains that the necessary measures to minimize costs would not be undertaken in socialism. The collective institution "allows firms to survive that, in the interests of society, it would be useful if they disappeared" and should be replaced by firms capable of producing at lower costs (Barone [1921] 1936, p. 340). This led Barone to argue that innovation would not happen under socialism. In fact, Barone argues that the state in general is unable to innovate: "A man of initiative … would be wasting his time if he wished to convince those weighty hierarchies, that are the necessary organs of the thought and action of the state" (Barone [1914-15] 2002, p. 140)[55].

Although Barone showed that theoretically the Ministry of Production could attain the same outcomes as perfect competition, he believed the best practical solution remained the private-property market economy, with a minimum economic role for the state beyond maintaining a stable environment for private decision making. This limitation of the direct economic powers of the state for him is actually indispensable in democracies, where power is in the hands of the masses.

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[54] Concerning crises, Barone argues that: "having to proceed by trial and error and experiments … the collectivist ministry of production could not in any way avoid for higher cost firms … those destructions that one thinks are an exclusive effect of the present economic régime" (Barone [1909] 1936, p. 645).

[55] These subjects are dealt with in depth in Michelini (2005) who finds precisely in the impossibility to innovate the crucial point of the arguments used by Barone to show that socialism cannot be realized, arguments Michelini shows to be unconvincing.

Since, as we have seen, he thinks that the masses are incapable of pursuing the interests of society as a whole, he recommends that the powers of parliamentary governments, representative of the interests of the masses, be limited as far as possible. But he goes further than this. His recommendation of a minimal economic role for the state should apply generally, to any kind of political institutions. He reasons that "the state … is always, more or less, the organ of certain specific interests" (Barone [1914-15] 2002, p. 140) and that governments in general are not enlightened[56]. Given all this, the lesser evil for Barone is a capitalism regulated by a government in the hands of a bourgeois *élite* whose members are always subject to competition from new members, which "limits itself … to its essential functions and carries them out with the maximum effectiveness" (Barone [1914-15] 2002, p. 141)[57].

However, on examining a war economy, Barone's comes to a different conclusion. For him a war economy "in certain respects, resembles a society already driven forward in a collectivist régime" (Barone [1919-20] 1936, p. 677). The intervention of the government in this circumstance is for him justified by the "suddenness of catastrophes, for which private initiative is either paralyzed or would arrive late" (Barone [1919-20] 1936, p. 678). Thus, Barone continues, the government did not make a mistake in intervening in a war economy, in the production of war materials, in transport, in natural monopolies (like that of coal in Germany), in credit, in international exchanges, in public purchases of goods and (in the unprecedented guise of innovator) in agriculture, in which "initiatives are always slow and apathetic" (Barone [1919-20] 1936, p. 678). In these cases the government:

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[56] Barone writes: "the individuals brought to power [do not become] more enlightened than they were before, only because they exercise power" (Barone [1914-15] 2002, p. 139). For him the government, instead of acting with intelligence, consigns "the delicate apparatus into the hands of the audacious and irresponsible, of shameless improvisers, of ignorant empiricists" (Barone [1919-20] 1936, p. 699).

[57] The "essential purposes" of the state for Barone are: "defense abroad, and respect for the law at home", and he adds "This the *desideratum*. Which … in governments based on the people can be achieved only in part" (Barone [1914-15] 2002, p. 140-141, author's italics).

> should have done what an intelligent ministry of production and consumption would do in a collectivist state … It would have been a monstrous centralization … a mammoth bureaucracy … but at least, somehow or other, even if with more tortuous, cumbersome provisions, it would have finished by approaching that *maximum* that, automatically and without being aware of it, competition and speculation bring about (Barone [1919-20] 1936, p. 699 Barone's italics).

So if in conditions of peace the only practical choice is the decentralised market, in times of war centralized planning and allocation are required. For Barone, in these conditions the only practical choice is centralized economic control. We note in passing that in this context the Ministry of Production takes on the features that recall the rational leaders of his military writings.

It is thus possible at this point to summarize the role of the *Ministry* in Barone's overall vision. In theory, the outcomes of the Ministry are equivalent to those of perfect competition. In actual fact, in general, the best choice is a state with minimal direct economic functions. Nonetheless, there are exceptions in which the government may intervene to benefit society. One of these exceptions was the Germany of his era, where the state had broadened its functions successfully. Another was the war economy, where the action of the Minister of Production was even preferable to that of the market.

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